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(72) Inventors:
• **Chevassus-More, Alain**
25370 Touillon et Loutelet (FR)
• **Pernot, Christian**
25300 Pontarlier (FR)

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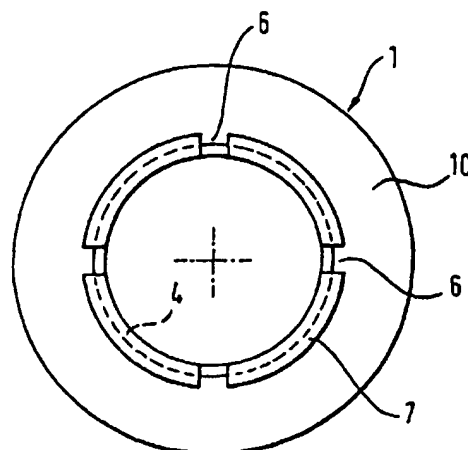
(74) Representative:
Beetz & Partner
Patentanwälte
Steinsdorfstrasse 10
80538 München (DE)

(71) Applicant:
FRAMATOME CONNECTORS INTERNATIONAL
92400 Courbevoie (FR)

(54) **A contact clip, intended most notably for busbar systems**

(57) The invention is a clip (1) for the placing in contact with, and the retention of a contact pin within an opening (2) in a conductor (3) manufactured in the form of a sheet or board. This clip includes a cylindrical sleeve (4) possessing, at at least one of its ends, shoulders (5) for fitting against the edge of the opening or against an intervening component. According to the invention, the sleeve (4) has at at least one of its ends a number of open slots (6) extending parallel to its main axis, the end of the sleeve at said end projecting above the surrounding surface and possessing a profile in the form of truncated cone creating an abutment (7) enabling the sleeve to fit into a corresponding annular groove (9) made in the surface of a backing ring (8).

Fig. 1



Description

[0001] The present invention relates to a clip for the placing in contact with, and the retention of a contact pin within an opening in a conductor manufactured in sheet or board form as described in the introduction of claim 1. Such contact-clips are the preferred device for the connection of busbar systems.

[0002] Clips of this type possess a sleeve which fits into a corresponding opening in the conductor in sheet or board form. A lip or other feature widening its diameter, forming a shoulder abutment, helps maintain the clip in position for the purpose of crimping it into the opening. On the opposite face of the sheet or board conductor a backing ring is positioned on the sleeve which projects above the surrounding surface. The contact pin, which is inserted into the sleeve, has a screw thread of a type permitting the pin to be maintained within the clip by means of a nut which is tightened up against the backing ring. This results in a deformation of the clip, thus ensuring very close contact between clip and the edges of the opening in the sheet or board conductor.

[0003] However, such a clip has numerous disadvantages. Firstly, it may be lost prior to the introduction of the contact pin due to the fact that crimp assembly on a sheet or board conductor, which is thin, does not permit good mechanical integrity to be ensured for a clip of large diameter. The clip may become detached and fall during shipment or during handling of the sheet or board conductor. Secondly, such a clip may easily jam or be incorrectly fitted such that it no longer bears down upon its entire contact surface, creating conditions in which low contact resistance can no longer be guaranteed. Moreover, when the contact pin is withdrawn, the clip is in most cases so misshapen that it cannot be used a second time.

[0004] The object of the present invention is to provide a clip as described in the introduction of claim 1 that may be fitted to the sheet or board conductor in such a manner that there is no risk of its being lost, becoming unsuitable for reuse or jamming.

[0005] The problem as defined has been resolved as set out in the claims.

[0006] The preferred shapes of the parts for the embodiment of a clip as defined in the invention is described in the sub-claims. The invention will be better understood with the help of the description of the two embodiments described hereinafter and with reference to the appended drawings in which:

Fig. 1 illustrates one embodiment of the clip in accordance with the invention, showing a sectional view, a plan view and a detail view of one of the ends of the sleeve.

Fig. 2 shows a second embodiment of the clip in accordance with the invention, seen in sectional and plan views.

Fig. 3 shows a backing ring used in conjunction with the clip in accordance with the invention.

Fig. 4 shows a specific arrangement intended to prevent rotary movement of the clip.

[0007] The clip in Figure 1 has a sleeve 4, which is cylindrical in form, with a diameter slightly smaller than the diameter of opening 2 in a conductor 3, which is in sheet or board form. The clip 1 possesses, on the top end of the cylindrical sleeve 4, a lip 10 whose bottom surface allows the clip to bear down upon on the conductor 3. The bottom end of the cylindrical sleeve 4 possesses an abutment 7 in the form of a double truncated cone with rounded edges, extending the outer diameter of the main body of the sleeve 4, at a sharp angle, and which diminishes towards the end in the direction of clip connection at a shallow angle. The double cone thus forms outside the sleeve 4 an abutment which enters annular groove 9, into which it fits, said groove being made in the surface of a corresponding backing ring 8.

[0008] The cylindrical sleeve possesses a number of slots 8 open towards the sleeve end possessing the abutment 7, imparting flexibility to the cylindrical body of the sleeve, in such a manner that the sleeve, including the abutment 7, is enabled to pass through opening 2 in the sheet or board conductor. Due to the ensuing spring-back effect, the clip can already at this stage of assembly be fitted to the sheet or board conductor without risk of its being lost, but is nevertheless removable due to the sharp angle of the double cone, if strong pressure is applied parallel to the main clip axis. The elastic reduction of the outer diameter of the abutment 7 is also necessary to allow the front edge of the clip sleeve to slot into place. The clip sleeve is all the easier to slot into place since the double cone has been given rounded edges, in order to ensure that there is more play in the assembly than would be the case if its edges had been made sharper.

[0009] The inclusion of such abutments allows the outer diameter of the clip sleeve 4 to be made smaller than is currently the case for identical opening sizes in the sheet or board conductor, with the result that a lesser level of precision is required for the opening and the diameter of the sleeve. This enables reductions to be achieved in manufacturing costs not only for the clip but also for the openings in the sheet or board conductor. Furthermore, the play between the clip and the opening in the sheet or board conductor allows the fit to be adjusted more minutely during the insertion of the contact pin, in such a manner that any jamming can effectively be avoided.

[0010] Figure 2 illustrates an embodiment of the clip 1 in accordance with the invention in which a second abutment 7 is provided in replacement for the lip 10, in such a manner that it becomes possible for this clip to include two backing rings, respectively 8 and 12, on each side of the sheet or board conductor 3. To accom-

plish this, four slots per face are made in the sleeve wall. In this embodiment, the clip does not act as a conductor of current, since it is independent of the surfaces ensuring electrical continuity. Consequently, in this case the clip may be manufactured in plastic. Similarly, the clip illustrated in figure 1 may, according to the chosen application, play no role in conducting electricity, and may therefore be manufactured in plastic.

[0011] Figure 3 shows the backing ring with no clip fitted. It can be seen that on the right-hand side, the side through which the clip sleeve is inserted, the inner diameter matches approximately the outer diameter of the clip sleeve, whereas the diameter of the backing ring to the left of the groove 9 matches the inner diameter of the clip sleeve 4. In this way, it can be guaranteed that a contact pin inserted in the assembly formed by the clip and the backing ring is always positioned within the clip and backing ring with the same clearance.

[0012] In the case of an embodiment of the clip according to the invention, the contact pin inserted into the clip is also screwed into place. Since it is easier to orient the contact surfaces prior to tightening the screws, the clip is deformed to a lesser degree and may therefore be reused.

[0013] For contexts in which high levels of screw torque are applied to the contact pin within the sleeve, a special arrangement of the conductor 3 has been defined with the intention of preventing rotary movement of the insert in relation to the sheet or board conductor.

[0014] Figure 4 shows an example of this arrangement. The opening 2 in the conductor 3 is machined similarly to a gear wheel with an internal set of four teeth 15. The slots 6 in the envelope of the sleeve are deeper, in such a manner that the body of the sleeve 4 and the double cone shape of its termination form claws 16 which enter the kidney-shaped grooves defined by the teeth 15. The teeth 15 form abutments opposing rotary movement of the claws 16. The slots 6 are sufficiently deep to ensure that the lower surface of lip 10 of the insert bears down upon the conductor 3.

[0015] The clip as defined in the invention is particularly suitable for connecting conductors in sheet or board form, these being components in common use for busbars carrying high-amperage currents.

[0016] The invention is not limited to the embodiments described and presented here, but extends to all variants covered by the detailed claims.

Claims

1. A clip (1) for the placing in contact with, and the retention of a contact pin within an opening (2) in a conductor (3) in sheet or board form, including a cylindrical sleeve (4) possessing at at least one of its ends shoulders (5) for fitting against the edge of the opening or against an intervening component, characterised by the fact that the sleeve (4) pos-

sesses at at least one of its ends open slots (6) extending parallel to its main axis, the edge of the sleeve at that end projecting above the surrounding surface and shaped in the form of a truncated cone, creating an abutment (7) permitting the sleeve to fit into a corresponding annular groove (9) created in the surface of a backing ring (8).

2. A clip as defined in claim 1, in which the abutment (7) is a double truncated cone widening the outer diameter of the envelope of the sleeve (4), projecting at a sharp angle and diminishing at a shallow angle towards the end lying in the direction of the clip connection, its edges being rounded in order to increase clip connection play.
3. A clip as defined in claim 1, in which a lip (10) is included at one of the ends of the sleeve, said lip presenting a bearing surface (11) extending along a plane perpendicular to the main axis of the sleeve.
4. A clip as defined in claim 1 or 2, in which at both ends of the sleeve tapered abutments (7) have been included, in addition to open slots (6), in such a manner as to allow two backing rings (8 and 12) to fit into place on either side of the conductor in sheet or board form (3).
5. A clip as defined in any of the preceding claims, in which several slots (6) open toward the same end, and with the same angular separation between each, are included in the sleeve (4).
6. A clip as defined in claim 4, in which at least four slots (6), depending on connection force, are oriented toward each end of the sleeve (4), the width of said slots being variable in order to permit adjustment of the connection force, with an angular separation between any two neighbouring slots equal to 90°, or less depending on the total number of such slots.
7. A clip as defined in claim 4, in which the slots (6) are deeper, in such a manner that the body of the sleeve (4) and its double-cone-shaped termination form claws (16) which enter kidney-shaped grooves (17) defined by teeth (15) inside the opening (2) of the conductor (3), such teeth (15) acting as abutments preventing rotation of the clip.
8. A clip as claimed in any one of the preceding claims, in which, in the area located between the annular groove (9) and the termination (13) nearest the sheet or board conductor (3), the inner diameter of the backing ring (8 or 12) matches the outer diameter of the body of the sleeve (4).
9. A clip as defined in claim 6, in which, in the area

located between the annular groove (9) and the end (14) most distant from the sheet or board conductor (3), the inner diameter of the backing ring (8 and 12) matches the inner diameter of the sleeve (4).

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10. The use of a clip as claimed in any of the preceding claims for the purpose of placing a contact pin in contact with a busbar conductor.

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Fig. 1

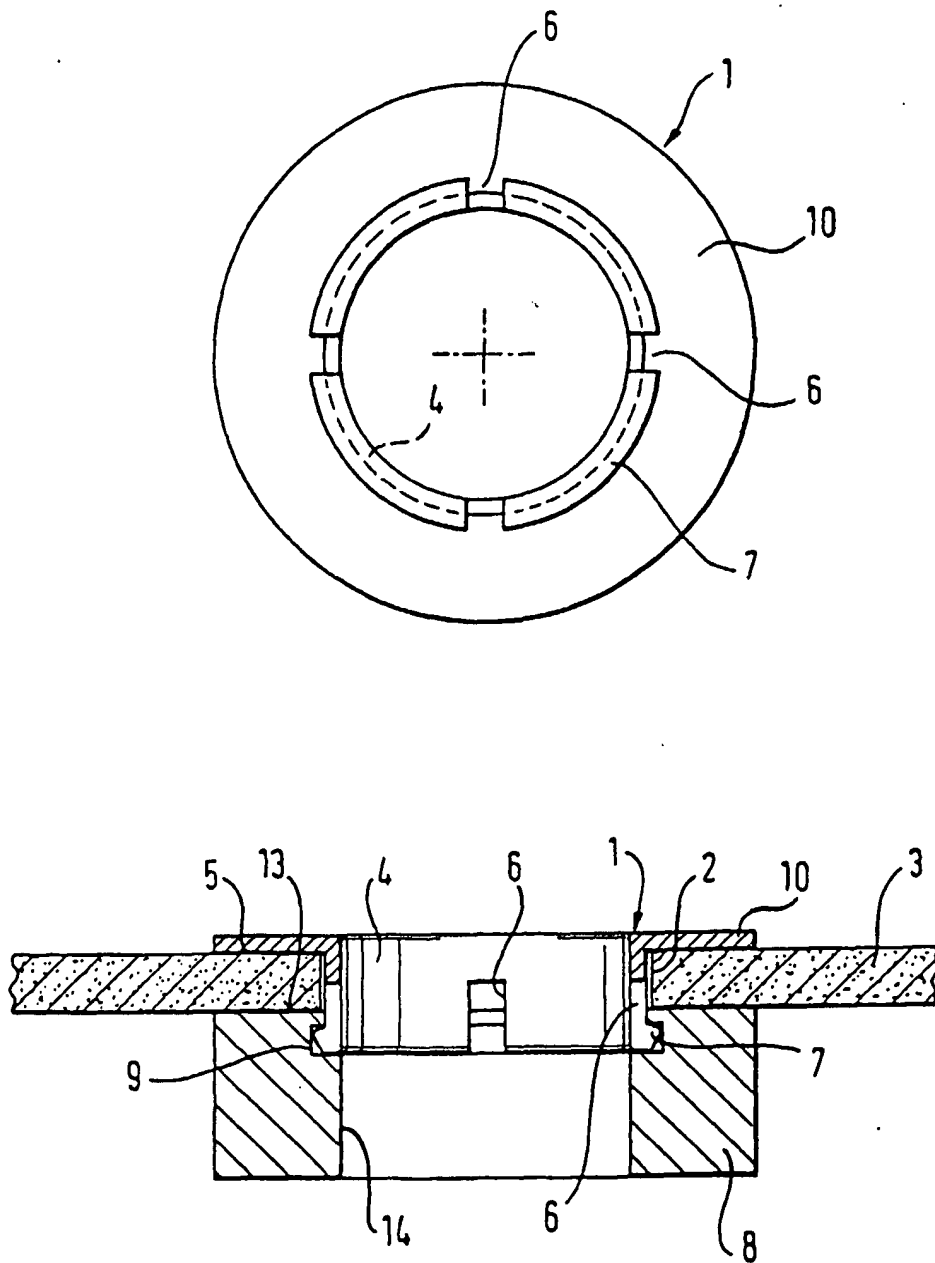


Fig. 2

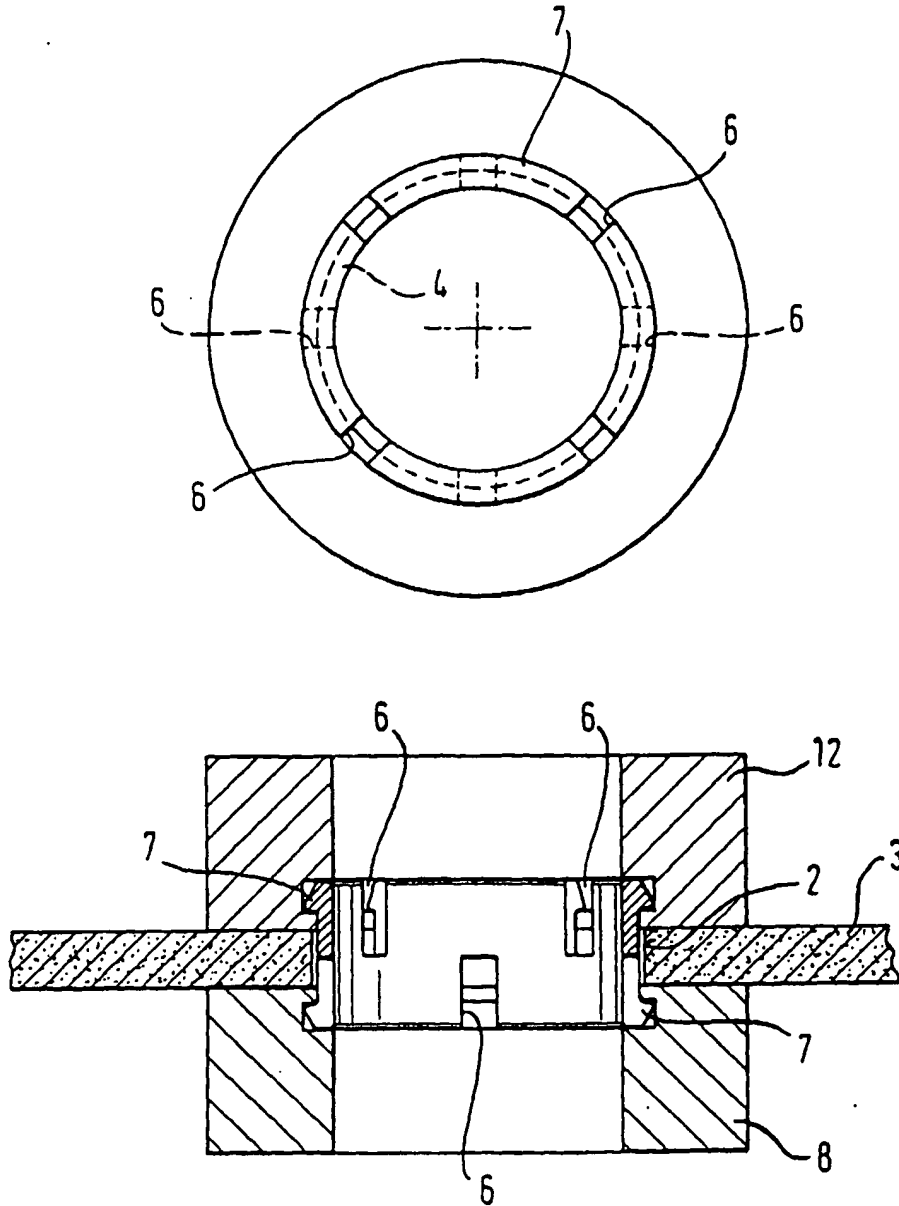


Fig. 3

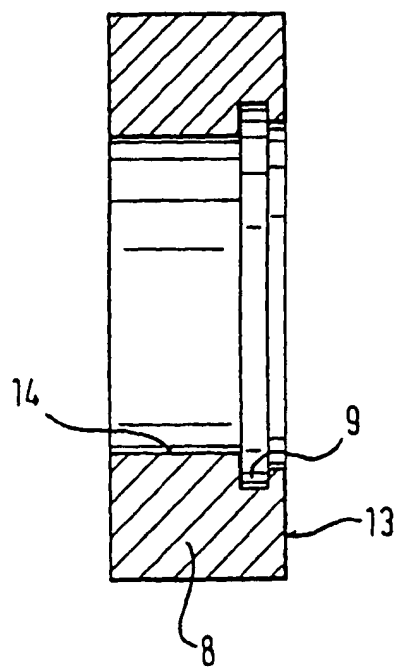
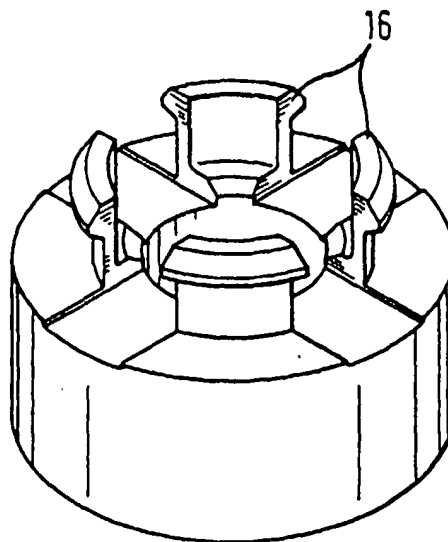
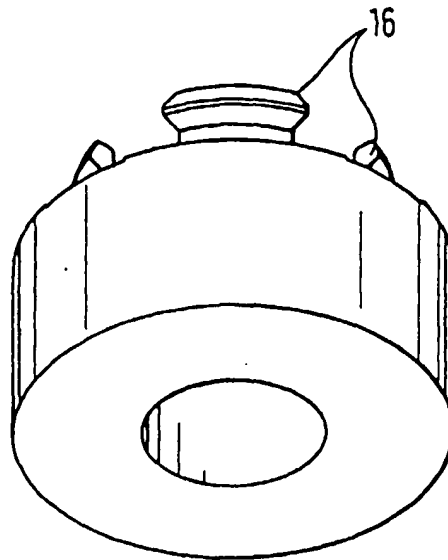


Fig. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 11 9118

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 068 771 A (SAVAGE JR JOHN M) 26 November 1991 (1991-11-26)	1-3	H01R13/74 H02B1/044 F16B21/06
A	* column 2, line 27 - column 3, line 36; figures 1-4 *	5,6	

A	GB 1 028 208 A (OXLEY, R.F.) 4 May 1966 (1966-05-04) * page 2, line 5 - line 90; figure 1 *	4	

			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R H02B F16B H01B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 December 1999	Examiner Salojärvi, K
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 11 9118

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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